MODEL 7034
UNIVERSAL
COUNTER-TIMER

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1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION

The SD 7034 is a portable high frequency universal electronic counter-timer. The use of modular plug-in circuit boards and proven solid-state components produces outstanding reliability coupled with ease of maintenance. Lightweight carry-type design (13 pounds, 5.25 x 10.25 x 15 inches) and precision circuitry yield accurate measurements under limited time and space conditions. The standard SD 7034 provides the following additional features:

a) Easily read storage type display which permits reading to be displayed while new measurement is made and provides automatic units-of-measure and decimal point indications.
b) Direct frequency measurements to 20 MHz.
c) Decade scaling to 10^8 for any frequency up to 10 MHz.
d) 10 millivolt sensitivity for inputs up to 12.5 MHz.
e) Marker level outputs for displaying the triggering points on an oscilloscope when making precision time interval measurements.
f) Switch selectable 115 or 230 volt power supply.
g) Large range of custom application standard options.

1.2 FUNOTIONAL DESCRIPTION

The SD 7034 Universal Counter-Timer will make direct frequency measurements up to 20 MHz and period measurements with 0.1 microsecond resolution. The basic modes of measurement include: TIME B-A (Time Interval), HOLD, COUNT (Totalize), RATE A (Frequency), PER A (Period), PER A X MULTiplier, and RATIO A/B X MULTiplier. The SD 7034 also incorporates built-in test circuitry to assure optimum performance. Additionally, the SD 7034 time base generator provides a wide range of outputs (from 0.01 Hz to 10 MHz) as well as a constant 1 MHz output.

1.3 APPLICATIONS

The SD 7034 finds wide use wherever critical frequency and time interval measurements are to be made. It is commonly used to design and calibrate receiving equipment, tuned circuits, crystals, etc. Because of its accuracy and stability, it is invaluable for checking long term drift and heat-cycling stability of crystals and other signal generators. With suitable input transducers, the SD 7034 measures speed, acceleration, vibration, flow rate, force, and the like.

1.4 SPECIFICATIONS

The following specifications are applicable to the standard SD 7034. Optional features specifications are included in Section 1.5, Optional Equipment.

TABLE 1-1

SPECIFICATIONS

FREQUENCY MEASUREMENTS

Range: 0 to 20 MHz (DC input), 10 Hz to 20 MHz (AC input).

Input Impedance: 1 Megohm/50 pF.

Sensitivity: 10 mV -- dc to 12.5 MHz, 60 mV -- 12.5 to 20 MHz.

Gate Time: from .1 microsec. to 100 seconds in decade steps.

Accuracy: ±1 count ± time base accuracy.

Reads In: Hz, kHz, MHz, and GHz.

Self-Test: counts 10 MHz for gate time selected.

SCALING

Frequency Range: 0 to 10 MHz.

Function: divides input frequency (in decade steps from 10 to 10^8).

Input: J1 (A INPUT) on front panel.

Output: in place of time base frequencies at J17 (OUT

TABLE 1-1 (continued)

SPECIFICATIONS

SCALE/T.B. OUT) on rear panel when SD 7034 is in COUNT mode.

PERIOD AVERAGE MEASUREMENTS

Range: single or multiple period, 0 to 10 MHz.

Periods Averaged: 1 to 10^8 in decade steps.

Accuracy: ±1 count ± time base accuracy ± trigger error (Trigger error is less than +0.3% of one period divided by the periods averaged for signals with 40 db or better signal-to-noise ratio).

Sensitivity: 100 mV -- dc to 1 kHz, 50 mV -- 1 kHz to 10 kHz, and 10 mV -- 10 kHz to 10 MHz.

Frequency Counted: selectable from .01 Hz to 10 MHz in single period; counts 10 MHz in multiple period.

Reads In: ns, μs, ms, sec, or ks with positioned decimal point.

Self-Test: measures period of internal 10 MHz signal.

TIME INTERVAL MEASUREMENTS

Range: 0.1 μsec to 10^9 seconds.

Inputs: channels A & B identical.

Frequency Counted: 10 MHz to .01 Hz in decade steps.

Reads In: microseconds, milliseconds, seconds, and kiloseconds with automatically positioned decimal point.

RATIO MEASUREMENTS

Displays: (freq. A/freq. B) times multiplier.

Range: A -- 0 to 20 MHz, B -- 0 to 10 MHz. Ratios averaged are from 1 to 10^8 in decade steps.

Sensitivity: A -- 0 mV (dc to 20 MHz), B -- 100 mV (dc to 1 kHz) and 10 mV (1 kHz to 10 MHz).

Accuracy: ±1 count of A ± trigger error of B.

Reads In: dimensionless units with automatically positioned decimal point (10^8 ratios require E

TABLE 1-1 (continued)

SPECIFICATIONS

option for correct indication).

Self-Test: measures internal 10 MHz applied to A and B INPUTS in the selectable multiples.

TIME BASE

Crystal Frequency: 1 MHz.

Stability: Aging rate -- less than ±2 parts in 10^6/month. As a function of temperature -- less than ±1 part in 10^5 from +15 to +35°C; less than ±3 parts in 10^5 from 0 to +50°C. As a function of line voltage -- less than ±1 part in 10^6 for ±10% change.

External Input: 1 kHz to 2 MHz sinewave, 1V to 10V rms maximum, into 1000Ω at rear panel BNC.

Output Frequency: 1 MHz at approx. 3V peak-peak minimum with open circuit. Source impedance 2000Ω maximum.

Time Base Outputs: switch selected, available at rear panel BNC. In COUNT, provides scaling of A Amp. input signal (to 10 MHz).

INPUTS

Input Levels (A and B): ±0.15 volt times attenuation factor. PRESET position (TRIGGER LEVEL control) automatically sets trigger level to 0 volt.

Channel Control: provides for separate input control of channel A and channel B; provides for common input to channels A and B; provides 10 MHz test signal to channels A and B.

Coupling: AC or DC, switch selectable.

Attenuation: by steps with factors of 1, 10, and 100.

Overload Without Damage: 75V peak at X1, 200V peak at X10, 300V peak at X100 ATTENUATOR switch position.

TABLE 1-1 (continued)

SPECIFICATIONS

GENERAL

Registration: 7 digits in-line with automatic units-of-measure and decimal point position indications. Off-scale indication when digital display fills (9,999,999) plus one or more counts.

Display Storage: provides continuous display of most recent measurement. Rear panel switch overrides storage.

Reset: manual pushbutton; contact closure or saturated NPN transistor to ground via rear panel BNC connector.

Marker Outputs: rear panel BNC connectors provide a 0.5 μsec. shaped pulse or dc level, switch selectable, from both the channel A and channel B input amplifiers. Signal amplitude is approximately 0 to +5 volts.

Power: 115/230V ±10%, 50 to 60 Hz, 45 watts maximum.

Operating Temperature Range: 0 to 50°C.

Dimensions: 5 1/4 in. high by 10 1/4 in. wide by 15 in. deep.

Weight: 13 pounds net; 15 pounds shipping.

1.5 OPTIONAL EQUIPMENT

A number of standard options are available for use with the Model 7034. These factory installed options permit the instrument to be custom made for specific applications. Currently available options include:

a) B1 Option. Time base accuracy is improved by the substitution of a heated crystal oscillator (aging rate --

less than ±1 part in 10^8/day after 30 days of dynamic aging.

b) B3 Option. Time base accuracy is improved by the substitution of a more stable oscillator (aging rate -- less than ±3 parts in 10^9/24 hours) for the standard oscillator.

c) B Option. Time base accuracy is improved by the substitution of a high stability oscillator (aging rate -- less than ±1 part in 10^9/24 hours) for the standard oscillator.

d) B4 Option. Time base accuracy is improved by the substitution of a very high stability oscillator (aging rate -- less than ±5 parts in 10^{10}/24 hours) for the standard oscillator.

e) D3 Option. An additional plug-in PC board provides complete measurement result information in BCD form (1-2-4-8) at the rear panel BCD OUTPUTS connector for use with peripheral equipment (printers, etc.). Logical 1 is approximately 5.0 volts (open circuit) and logical 0 is approximately 0 volts. Source impedance is 5.7 kohms. Print command: step from 0V to +5V. Inhibit: 0 volt inhibits, +10 volts operates.

f) E and EE Options. Resolution is increased by the addition of another readout tube (E option) and associated components or by the addition of two readout tubes (EE option) and their associated components.

g) N Option. Rack mount hardware, easily installed and removed, is factory supplied ready to adapt the SD 7034 to standard 19 inch rack configurations.

2 INSTALLATION

2.1 INTRODUCTION

This chapter presents procedures for inspection and initial installation. Reshipment instructions have been included should the instrument require return to Systron-Donner Corporation.

2.2 RECEIVING INSPECTION

Before accepting the instrument from the shipper, inspect the instrument's shipping container for signs of external shipping damage. Any sign of such damage must be noted by both the shipper and customer; and, should be reported to the insurance investigator.

As soon as the instrument is unpacked, inspect it for shipping damage. Check for scratches or dents, broken or cracked knobs, and damaged connectors. Should any damage be found, notify your nearest Systron-Donner representative -- do not use the instrument until instructed to do so by the representative.

2.3 POWER CONNECTION

The SD 7034 may be operated from 115-or 230-volt ac (±10%) power lines. The LINE switch on the rear panel permits quick conversion for operation from either voltage. Insert a narrow-blade screwdriver in the switch slot and slide the switch to the right for 230-volt operation ("230" marking exposed) or to the left for 115-volt operation ("115" marking exposed). The instrument is factory-supplied with a 115-volt fuse; be sure to replace this fuse for 230-volt operation -- see table 2-1.

CAUTION

Before connection of instrument into ac power line, make sure LINE switch is properly positioned.

The SD 7034 is equipped with a standard three conductor

power cord that automatically grounds the unit when a matching power receptacle is available. An adapter which provides an instrument ground should be used whenever the power cord must be connected to a two-contact outlet.

TABLE 2-1		
115/230V POWER CONVERSION		
Conversion	115 Volt	230 Volt
LINE switch	Left ("115")	Right ("230")
AC LINE fuse	1 amp slow-blow	0.5 amp slow-blow

2.4 COOLING

The Model 7034 uses forced air cooling -- the air exhaust is located on the rear panel of the instrument. Make sure the air exhaust guard is in place before applying power to the instrument. Under no circumstances should the air exhaust be obstructed when instrument is operating.

2.5 INITIAL TURN-ON

This procedure checks the SD 7034 for any major internal shipping damage. Successful completion of the below listed tests should precede implementation of the Performance Test (outlined in detail in Section 5).

a) Place LINE switch to proper position (Table 2-1) and connect instrument to ac power source.

b) Set POWER/RECYCLE RATE switch to on and midrange -- display illuminates. Set A and B TRIGGER LEVELS to PRESET.

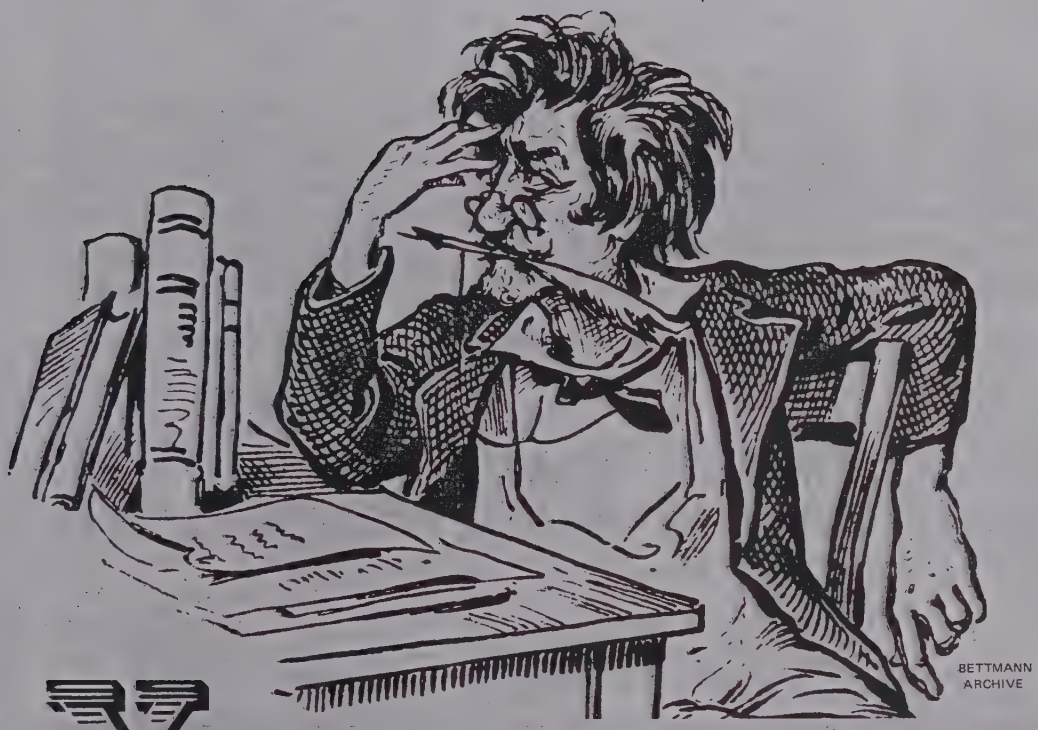
c) Place STORAGE to ON and COMmon/SEParate/TEST switch to TEST. Set FUNCTION switch to RATE A and TIME BASE/ MULTIPLIER switch to 10^{-1} -- display should indicate 10000.00 kHz ±.01 kHz.

d) Place FUNCTION switch to PER A X MULT and Time Base/ MULTIPLIER switch to 10^{3} position -- display should read 000100.0 nS ±0.1 nS.

e) Place FUNCTION switch to RATIO A/B X MULT -- display should read 0001.000.

2.6 PREPARATION FOR RESHIPMENT

Should it become necessary to reship the instrument, contact the nearest Systron-Donner field office for shipping instructions. If possible use the original packaging materials or replace in accordance with MIL-P-116 and MIL-E-17555E. The field office can provide materials similar to those used for original factory packaging. All correspondence should refer to the full nomenclature and serial number of the instrument involved.



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3 OPERATION

3.1 INTRODUCTION

This section describes the SD 7034 controls, connectors, and indicators. Information about factors which affect the accuracy of counter-timer measurements is also presented. Finally, the step-by-step operating procedures are listed for each of the counter-timer basic functions. Figures 3-1 and 3-2 illustrate the SD 7034 front and rear panel controls, connectors, and indicators and Tables 3-1 and 3-2 provide a description of their functions.

3.2 FRONT PANEL

Table 3-1 describes the function of all front panel controls, connectors, and indicators and Figure 3-1 provides location information.

TABLE 3-1

FRONT PANEL DESCRIPTION

Figure	Index	Name	Function
3-1	1	POWER/RECYCLE RATE switch	POWER. Controls power to all circuits. Maximum ccw. (OFF position) removes power. RECYCLE RATE Varies duration of count display from approx. 0.2 to 5 seconds before the instrument is automatically reset for the next measurement cycle. In extreme cw. position (∞), the display will remain until RESET pushbutton is depressed.
3-1	2	FUNCTION switch	TIME B-A. Permits unit to count selected frequency (TIME BASE/MULTIPLIER switch) for time duration determined by signals applied to A and B inputs, in conjunction with SEP position of COM/SEP/TEST switch. If COM/SEP/TEST switch is placed in COM, unit will measure rise or fall time by counting selected frequency for time duration determined by A INPUT signal

TABLE 3-1 (continued)

FRONT PANEL DESCRIPTION

Figure	Index	Name	Function	
3-1	2	FUNCTION switch	TIME B-A	and TRIGGER LEVEL settings (A&B).
			COUNT-HOLD	Permits totalizing (COM/SEP/TEST switch in SEP) of pulses applied to A input when set to COUNT; holds accumulated count when set to HOLD.
			RATE A	Permits measurement of frequency applied to A INPUT (COM/SEP/TEST switch in SEP) during interval selected by TIME BASE/MULTIPLIER switch.
			PERIOD A	Permits instrument to count selected (.01 Hz to 10 MHz) time base frequency (COM/SEP/TEST switch in SEP) for time interval equal to period of one cycle of signal applied to A INPUT.
			PER A X MULT.	Permits period measurement (COM/SEP/TEST switch in SEP) of waveform applied to A input averaged over 1 to 10^8 periods.
			RATIO X MULT	Permits measurement (COM/SEP/TEST switch to SEP) of number of cycles at A INPUT during one cycle at B INPUT averaged over 1 to 10^8 (in decade steps) ratio measurements -- dependent upon TIME BASE/MULTIPLIER switch position.
3-1	3	TIME BASE/ MULTIPLIER switch	TIME BASE positions (black scale)	Selects gate time for frequency measurements; numbers listed on the switch scale are the gate times in seconds. Provides the frequency to be counted (and therefore the resolution) during period or time interval measurements.

TABLE 3-1 (continued)

FRONT PANEL DESCRIPTION

Figure	Index	Name	Function	
3-1	3	TIME BASE/ MULTIPLIER switch	MULTI-PLIER posi-tions (red scale)	Provides averaging (in decade steps from 1 to 10^8) of period average and ratio measurements. Selects the scale factor for all scaling operations; numbers listed on the switch scale are the scale factors (the selected input frequency divisors).
3-1	4	A ATTEN switch		Provides three ranges of input attenuation. The A INPUT signal is attenuated in decade steps (1, 10, and 100) and applied to the signal processing circuits.
3-1	5	B ATTEN. switch		Identical to Index 4, but for channel B.
3-1	6	A TRIGGER LEVEL control		Adjusts trigger level of signal processing circuits between approx. +.15 volt and -.15 volt in reference to the attenuated input signal. With reference to the unattenuated A INPUT signal, the trigger level is equal to the product of the selected attenuation factor and the trigger level voltage set by TRIGGER LEVEL control. In PRESET position, automatically establishes a trigger level of approximately zero volts.
3-1	7	B TRIGGER LEVEL control		Identical to Index 6, but for channel B.
3-1	8	A INPUT		Accepts an external signal for time interval, totalizing, frequency, period, or ratio measurement. In time interval measurement the A INPUT signal serves as the start measurement time and in ratio measurement as the numerator.

TABLE 3-1 (continued)

FRONT PANEL DESCRIPTION

Figure	Index	Name	Function	
3-1	9	B INPUT connector		Accepts an external frequency (COM/SEP/TEST switch to SEP) for time interval or ratio measurement. In time interval measurement the B INPUT signal serves as the stop measurement and in ratio measurement as the denominator.
3-1	10	A AC-DC switch		Permits choice of ac or dc coupling of the A INPUT signal. In the DC position, output pulses will be produced when the instantaneous dc+ac level of input voltage exceeds the triggering level. In the AC position, the dc component is removed and the instantaneous value of the ac component triggers the circuit.
3-1	11	B AC-DC switch		Identical to Item 10, but for channel B.
3-1	12	A SLOPE switch		Determines which slope of A INPUT signal will trigger the counting circuits. The positive-going slope triggers the count circuits in "+" position and the negative-going slope triggers count circuits in the "-" position.
3-1	13	B SLOPE switch		Identical to Item 12, but for channel B.
3-1	14	COM/SEP/ TEST switch	TEST	Permits counter to self-test all circuits in RATE A, PER A, PER A X MULT, RATIO A/B X MULT, COUNT A, or TIME B-A.
			SEP	Routes input signals along correct paths in order to perform basic counter functions. Should be positioned to SEP for all counter-timer functions except for rise and fall time (TIME B-A) measurements (COM position).

TABLE 3-1 (continued)

FRONT PANEL DESCRIPTION

Figure	Index	Name	Function
3-1	15	RESET pushbutton	Manually returns both displayed and internal counts to zero when depressed.
3-1	16	GATE lamp	a. Illuminated during measurement interval and off during final count display interval. b. Provides positive indication that instrument is counting when storage mode of display is used.
3-1	17	DISPLAY	a. Provides measurement result visually in decimal form (to 9999999). b. Provides decimal point position. c. Provides unit-of-measure information (Hz, kHz, MHz, GHz, ns, µs, ms, s, and ks). d. Provides off-scale (OS lamp lights) indication when measurement result exceeds readout limits of the display.

3.3 REAR PANEL

Table 3-2 describes the function of all rear panel controls and connectors and Figure 3-2 provides location information.

TABLE 3-2

REAR PANEL DESCRIPTION

Figure	Index	Name	Function
3-2	1	STORAGE switch	ON Provides a continuous display of most recent measurement. OFF Defeats storage function, permitting operator to observe counting cycle.
3-2	2	1 MHz INT-EXT connector	EXT. Provides the input connection for an external 1 MHz standard oscillator.

TABLE 3-2 (continued)

REAR PANEL DESCRIPTION

Figure	Index	Name	Function	
3-2	2	1 MHz INT-EXT connector	INT.	Provides the output connection for the fundamental (1 MHz) frequency of the internal standard oscillator.
3-2	3	INT-EXT switch		Controls the function of the 1 MHz INT-EXT connector. See Index 2 immediately above.
3-2	4	FUSE		Primary power line overload protection fuse; should be 1 ampere slow-blow for 115 V operation; should be 0.5 ampere slow-blow for 230 V operation.
3-2	5	AC LINE		Permits selection of either 115- or 230-Vac line; insert narrow blade and slide to left for 115 V, slide to right for 230 V operation.
3-2	6	BLOWER		Supplies forced air cooling to counter-timer.
3-2	7	OUT SCALE/ T.B. OUT connector		Supplies scaled (in decade steps to 10^8 -- TIME BASE/MULTIPLIER switch position) A INPUT frequency when counter-timer is in COUNT mode (COM/SEP/TEST switch to SEP). Supplies selected time base frequency (by TIME BASE/ MULTIPLIER switch) when counter-timer is not in COUNT or HOLD functions. Output signal amplitude, in both instances, approx. 0 to +5V.
3-2	8	RESET connector		Provides connection for a remote reset signal. See remote reset information in Table 1-1.
3-2	9	MARKER SELECT switch	PULSE	Provides a 0.5 µsec. (0 to +5V) pulse at the A and B MARKER connectors, on the rear panel, at the instant(s) the A and B channels trigger the counter.
			LEVEL	Provides a level change (0 to +5V) at the rear panel MARKER connectors at the instant(s) the A and B channels trigger the counter.

TABLE 3-2 (continued)

REAR PANEL DESCRIPTION

Figure	Index	Name	Function
3-2	10	A MARKER connector	Provides the output connection for the channel A trigger indicator signals (described above, Index 9).
3-2	11	B MARKER connector	Provides the output connection for the channel B trigger indicator signals (described above, Index 9).
3-2	12	BCD (optional) connector	Supplies display-readout information, in binary coded decimal form, to printer, analog convertor, or data processing equipment.
3-2	13	COARSE Frequency Adjustment	Permits adjustment of internal time base oscillator frequency to 1 MHz See Section 5, Maintenance, for more detailed information.
3-2	14	FINE Frequency Adjustment	Used with the optional (B, B3, B4) oscillators to increase the resolution of the 1 MHz internal time base oscillator frequency (1 MHz) adjustment.

3.4 MEASUREMENT ACCURACY

If the SD 7034 is to be used to make critical measurements, several factors which may cause errors in counter measurements must be considered. The following subsections illustrate most types of counter errors and present practical solutions to problems created by such errors.

3.4.1 OSCILLATOR STABILITY

One of the most significant error producing factors is inaccuracy of the timing interval, as determined by the stability of the crystal-controlled oscillator. The three most common causes of oscillator instability are the oscillator's inherent aging rate (± 2 parts in 10^6/month for standard unit), operating temperature variations, and line voltage fluctuations. To insure the highest oscillator stability, the following considerations apply:

a) Maintain the instrument plugged-in and turned-on to keep the internal oscillator constantly energized.
b) If the counter has been turned off for more than one hour, allow sufficient warm-up time to reach aging rate.
c) Maintain constant environmental conditions.
d) Monitor line voltage.
e) Employ, when possible, a higher stability oscillator.
f) Calibrate internal standard oscillator frequency.

3.4.2 GATING ERROR

Gating error is responsible for a possible error of ±1 count (in the least significant digit of the display) in all types of counter measurements. This error is possible because the incoming signal passing through the count gate is not synchronized with the time base pulses which control the gate.

As demonstrated in Figure 3-3, the first or last cycle of the input signal may or may not pass through the gate during the selected measurement interval.

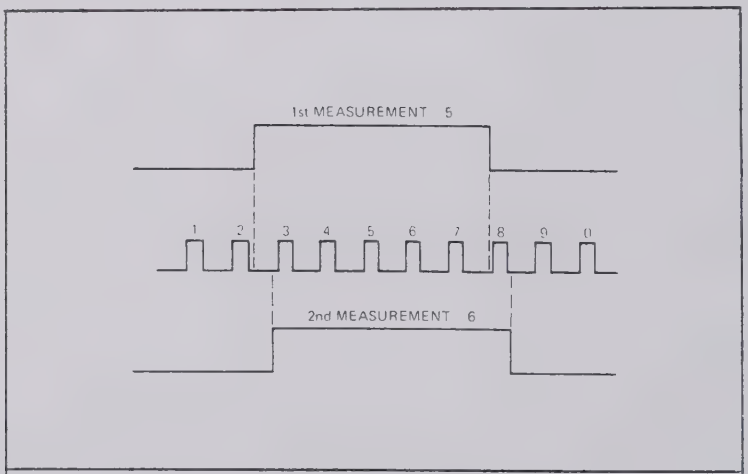


FIGURE 3-3 GATING UNCERTAINTY

For high frequency measurements, the ±1 count gating error is insignificant compared to the total count. At low frequencies, however, the error may become important. For this

reason, the period mode of measurement is normally used to obtain greater accuracy. Figure 3-4 shows which type of measurement will yield the lowest gating error.

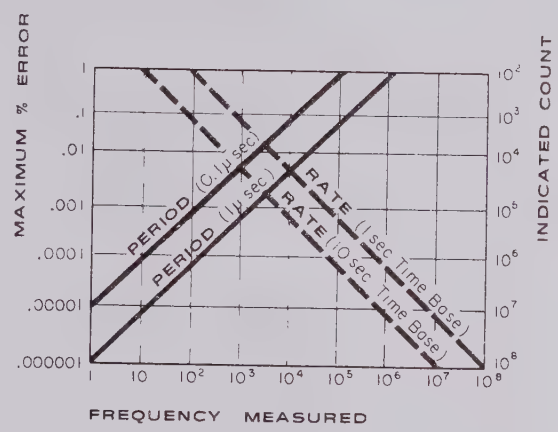


FIGURE 3-4 GATING ERROR:
RATE vs PERIOD MEASUREMENT

Gating error can be reduced by a factor of 10 by extending the interval of measurement (Period x 10, etc.). The total count is multiplied by ten but the gating error remains ±1 count.

For example, if a 10 kHz is measured over a 0.1 second time base, the count indicated would be 1000 ±1 and the percentage or error would be ±0.1%. Measured over a 1 second time base, the count indicated would be 10,000 ±1 and the percentage or error would be reduced to ±0.01%.

Noise superimposed on the input waveform may cause spurious count pulses to appear at the output of the input amplifier, which might then be counted, each time the input signal crosses and re-crosses the selected amplifier trigger voltage level, as shown in Figure 3-5. Since an input signal cycle must usually have amplitude of at least 0.2 to 0.3 volts p-p to

cause triggering, spurious counts can be eliminated by attenuating the total "input plus noise" signal to a suitable amplitude.

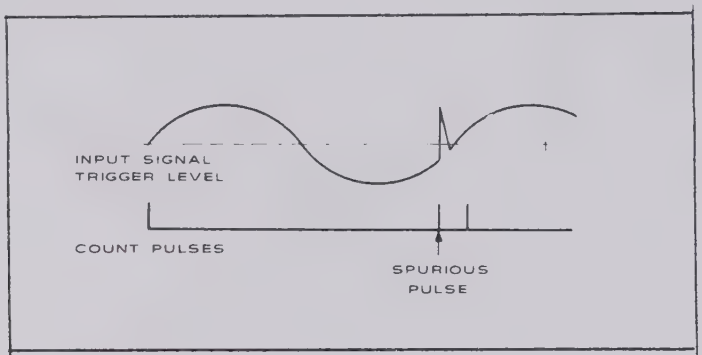


FIGURE 3-5 NOISE ON INPUT SIGNAL

It is important to have both attenuator and trigger level controls set properly when measuring signals under marginal conditions of noise.

3.4.3 LOADING ERROR

Especially noteworthy when making time interval measurements, this type of error occurs when the impedance presented by the counter-timer to the signal source is of such magnitude (input signal source impedance greater than 10% of the counter's input impedance) that it will modify the signal source impedance to a point where a phase or amplitude shift of the signal occurs. To avoid this type of error, proper matching of the 1 megohm inputs of the SD 7034 must be effected for all measurements.

3.4.4 TRIGGER ERROR

In addition to gating error, oscillator drift and loading errors, period and time interval measurements are subject to a trigger time error caused by noise on the input signal.

The total signal may be considered as an ideal noise free signal with a superimposed noise signal. The noise added

to the ideal signal may trigger the channel before or after the selected instant for triggering. The maximum error in time for a given peak-peak noise voltage (Vn), considering the slope of the ideal signal at the trigger level, is:

$$t\ (\text{sec}) = \frac{Vn \quad (\text{volts})}{\text{Slope} \quad (\text{volts/sec})}$$

The maximum percent error is

$$\text{Max \% error} = \frac{t \times 100 \quad (\text{sec})}{T \quad (\text{sec})}$$

For a sine wave triggering at its zero cross-over point:

$$\text{Max \% error} = \pm \frac{Vn \times 100 \quad (\text{volts})}{Vs \quad (\text{volts})}$$

This error effectively lengthens or shortens the period measurement as depicted in Figure 3-6. The percentage of error is given by the formula 100t/T, where "T" is the actual period and "t" is the trigger error (in seconds).

From the foregoing discussion, it can be seen that as the amplitude of signal voltage is increased, the percentage of error is diminished. In addition, if the trigger level is set at the center of the steepest slope of the waveform, the maximum error will be reduced.

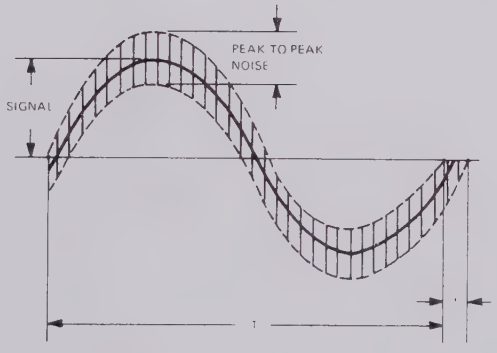


FIGURE 3-6 TRIGGER ERROR DUE TO NOISE

Another way to reduce trigger error is to measure multiple periods of the gating signal. Since this error occurs only with the first and last pulses of the measuring interval, the trigger error will be reduced by a factor of 1/M if the measurement is extended for M periods.

3.4.5 TOTAL ERROR

The various errors are cumulative and produce a "total error" for each of the counter-timer functions. See Table 3-3, Total Error.

TABLE 3-3
TOTAL ERROR

Function	Errors Present
Rate	Gating + Drift + Loading
Period	Gating + Drift + Trigger + Loading
Time Interval	Gating + Drift + Trigger + Loading
Ratio	Gating + Trigger + Loading

3.5 EQUIPMENT OPERATION

The following subsections explain the operating procedures associated with each of the counter's functions. All of the procedures have a "counter on and warmed-up" prerequisite (power should be applied for a few minutes).

3.5.1 COUNTER-TIMER SELF-TEST

The SD 7034 has been provided with built-in self-test circuitry to facilitate performance tests, calibration, and trouble isolation. An internally generated 10 MHz signal is used to test all counter-timer circuits -- A and B channel attenuation networks excepted. Tables 3-4 through 3-9 provide detailed Selt-Test procedures.

TABLE 3-4

TIME INTERVAL SELF-TESTS

The counter-timer self-tests the time interval circuits as follows: A 10 MHz sinewave, from the Oscillator-Multiplier, is sent to the A and B Amplifier and Shaper input pins (Pins 1). The amplified and shaped 10 MHz outputs (Pins 3) are routed to the Function Control Assembly Pins B (channel A) and D (channel B). Simultaneously, 10 MHz, 1 MHz, or a decade division of 1 MHz (from the Time Base and Oscillator-Multiplier) is routed to Count Gate IC9B (Function Control) to be gated by Gates A and B from the Control-Reset. The shaped channel A and channel B Amplifier outputs are directed (by the Function Control) to the Control-Reset Count Binaries (IC3 A and B) as "start" (channel A) and "stop" signals. IC3A and B generate Gates A and B which enable and disable Count Gate IC9B on the Function Control Board. In Time Interval Self-Test, the instrument counts the selected time base frequency (10 MHz, to be meaningful) for a 0.1 μsec. time interval. Procedural information follows:

Procedures	Desired Indication
1a) Place COM/SEP/TEST to TEST and A and B TRIGGER LEVELS to PRESET. Set ATTEN. switches to "1"	
1b) Set STORAGE To ON, TIME BASE/MULTIPLIER to "10^{-7}", and FUNCTION to TIME B-A.	000000.1 ±0.1 μsec.
2a) Place COM/SEP/TEST to TEST, A and B SLOPES to "+", and A and B TRIGGER LEVELS to PRESET. Set ATTEN switches to "1".	
2b) Set TIME BASE/MULTIPLIER to "10^{-6}", STORAGE to OFF, and FUNCTION to TIME B-A.	
2c) Rotate A TRIGGER LEVEL.	Display begins to totalize at a 1 MHz rate.
2d) Rotate B TRIGGER LEVEL.	Display stops totalizing.

TABLE 3-5

COUNT-HOLD SELF-TEST

The counter-timer self-tests the count-hold circuits as follows: A 10 MHz sinewave, from the Oscillator-Multiplier, is applied to the A Amplifier and Shaper input (Pin 1). The amplified and shaped output (Pin 3) is sent to Function Control Pin B. The 10 MHz is directed, internally, to Count Gate IC9B in the Function Control. If S1 (FUNCTION) is in COUNT, a ground is applied to Control-Reset Pin 3. This logical "0" produces Count Gate (IC9B, Function Control) enabling Gate A on Pin 7 of the Control-Reset. The counter-timer begins totalizing at a 10 MHz rate via Pin 11 of the Counting and Display. If S1 is in HOLD, a ground is applied to Control-Reset Pin 6. This logical "0" produces the Count Gate (IC9B, Function Control) disabling Gate B on Pin 5 of the Control-Reset. The counter-timer stops counting. Procedural Count-Hold Self-Test information follows:

Procedure	Desired Indication
a) Place COM/SEP/TEST to TEST. b) Place FUNCTION to COUNT A (storage is automatically defeated in COUNT A). Set A ATTENUATOR switch to "1". c) Set FUNCTION to HOLD d) Return FUNCTION to COUNT A.	Display begins to totalize at a 10 MHz rate. Display holds accumulated count indefinately. Display begins to totalize at a 10 MHz rate from count total at which HOLD was initiated.

TABLE 3-6

RATE SELF-TEST

The counter-timer self-tests the rate (frequency measurement) circuitry as follows: A 10 MHz sinewave, from the Oscillator-Multiplier is applied to the A Amplifier and Shaper input. The 10 MHz output is sent to Count Gate IC9B (Function Control). Dependent upon the TIME BASE/MULTIPLIER setting, IC9B has a variable, in decade steps, gate time -- 100 nanoseconds to 100 seconds. The Oscillator-Multiplier, in conjunction with the TIME BASE divider, generates the various gate times. The gated 10 MHz (A Amplifier input) is routed to the Counting and Display Pin 11. The Counting and Display decade chain counts the 10 MHz test signal for the time selected. The Rate Self-Test Procedure follows:

Procedure	Desired Indication
a) Set COM/SEP/TEST to TEST, STORAGE to ON, and channel A TRIGGER LEVEL to PRESET. A ATTEN. switch to "1".	
b) Set FUNCTION to RATE A and vary the TIME BASE/MULTIPLIER position. The displayed results should correspond to the TIME BASE/MULTIPLIER settings as follows:	
Setting	
10^{-7}	00000.01 ±.01 GHz
10^{-6}	0000010 ±1.0 MHz
10^{-5}	000010.0 ±0.1 MHz
10^{-4}	00010.00 ±.01 MHz
10^{-3}	0010.000 ±.001 MHz
10^{-2}	010000.0 ±0.1 kHz
10^{-1}	10000.00 ±.01 kHz
1	0000000 ±1.0 Hz. OS (Off-Scale) lamp illuminates.
10	000000.0 ±0.1 Hz. OS lamp illuminates.
100	00000.00 ±.01 Hz. OS lamp illuminates.

TABLE 3-7

PERIOD SELF-TEST

The counter-timer self-tests the period circuits as follows: A 10 MHz sinewave, from the Oscillator-Multiplier, is applied to the A Amplifier and Shaper input (Pin 1). The shaped 10 MHz output (Pin 3) is sent to Function Control Pin B. The shaped 10 MHz is then directed to Pins F and E of the Control-Reset as the "start" and "stop" signals. Simultaneous to the above operations, 10 MHz, 1 MHz, or a decade division of 1 MHz (dependent upon the TIME BASE/MULTIPLIER position) is routed to Count Gate IC9B Pin 3 (Function Control) from the Oscillator-Multiplier or Time Base. The "start" and "stop" signals produce, via the Control-Reset, the A and B Gate signals which in turn gate the shaped 10 MHz through IC9B (Function Control) to the Display (Pin 11). The counting and Display counts the selected frequency during a 100 μsec. interval. The Period Self-Test Procedure follows:

Procedure	Desired Indication
a) Set COM/SEP/TEST to TEST, STORAGE to ON, and channel A TRIGGER LEVEL to PRESET. A ATTEN. switch to "1". b) Set A and B SLOPES to "+", FUNCTION to PER A and vary the TIME BASE/MULTIPLIER position. The displayed results should correspond to the TIME BASE settings as follows:	
Setting	
100	000000.0 ±0.1 kS.
10	00000.00 ±.01 kS.
1	0000000 ±1 S.
10^{-1}	000000.0 ±0.1 S.
10^{-2}	00000.00 ±.01 S.
10^{-3}	0000000 ±1 MS.
10^{-4}	000000.0 ±0.1 MS.
10^{-5}	00000.00 ±.01 MS.
10^{-6}	0000.000 ±.001 MS.
10^{-7}	000000.1 ±0.1 μS

TABLE 3-8

PERIOD AVERAGE SELF-TEST

The counter-timer self-tests the period average circuitry as follows: 10 MHz (from Oscillator-Multiplier) is applied to A Amplifier and Shaper input (Pin 1). The A Amp. output (shaped 10 MHz) is sent to Function Control Pin B and is then directed to the Time Base (Pin C) where it is divided (dependent upon TIME BASE/MULTIPLIER position) before being sent to the Control-Reset as the "start" and "stop" signals. At the same time, 10 MHz (from Oscillator-Multiplier) is being supplied to IC9B (Function Control) via Function Control Pin Y. The "start" and "stop" signals produce, via the Control-Reset, the A and B Gate signals which in turn gate the shaped 10 MHz through IC9B (Function Control) to the Display (Pin 11). The Counting and Display counts the shaped 10 MHz during a time interval equal to the product of 100 µsec (10 MHz period) times the selected MULTIPLIER setting. The PER A X MULT Self-Test Procedure follows:

Procedure	Desired Indication
a) Set COM/SEP/TEST to TEST, STORAGE to ON, and channel A TRIGGER LEVEL to PRESET. A ATTEN. switch to "1". b) Set FUNCTION to PER A X MULT and vary TIME BASE/MULTIPLIER position. The displayed results should correspond to MULTIPLIER settings as follows:	*NOTE: All indications are ± time base accuracy ± trigger error.*
Setting	
1	000000.1 ±0.1 µS.
10	00000.10 ±.01 µS.
10^{-2}	0000.100 ±.001 µS.
10^{-3}	000100.0 ±0.1 nS.
10^{-4}	00100.00 ±.01 nS.
10^{-5}	0100.000 ±.001 nS.
10^{-6}	100.0000 ±.0001 nS.
10^{-7}	00.00000 ±.00001 nS. OS lamp illuminates.
10^{-8}	0.000000 ±.000001 nS. OS lamp illuminates

TABLE 3-9

RATIO SELF-TEST

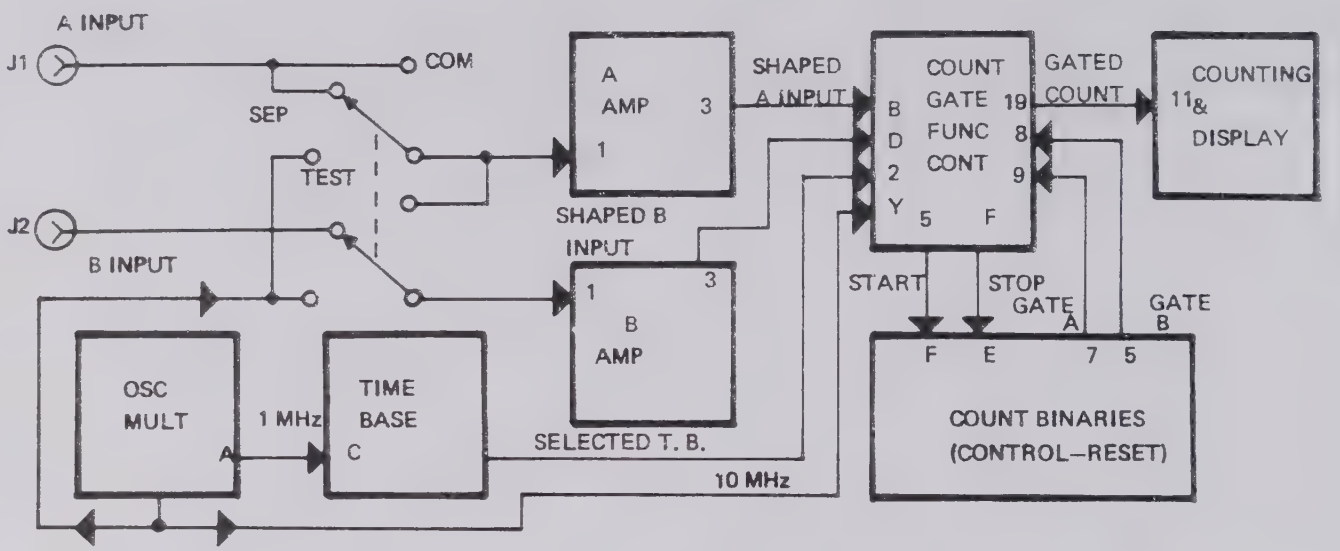
The counter-timer self-tests the ratio measurement circuitry as follows: 10 MHz, from Oscillator-Multiplier, is applied to the A and B Amp and Shaper inputs (Pins 1). The shaped A output is sent to Count Gate IC9B (via Function Control Pin B) and the shaped B output is sent to the Time Base divider (Pin C). The B output is divided by some factor of ten (dependent upon TIME BASE/MULTIPLIER position) and is directed to the Control-Reset as the "start" and "stop" signals. The " start" and "stop" signals, via Control-Reset, produce the A and B Gate signals (Pins 9 and 8, Function Control) which in turn gate the shaped A input through IC9B (Function Control). The gated signal is sent to Counting and Display Pin 11. The Counting and Display counts the shaped (A input) 10 MHz during a time interval equal to the product of 100 μsec (B input, 10 MHz period) times the MULTIPLIER setting. The Ratio Self-Test procedure follows.

Procedure	Desired Indication
a) Set COM/SEP/TEST to TEST, STORAGE to ON, and channels A and B TRIGGER LEVELS to PRESET. Set A and B ATTEN. switches to "1".	*NOTE: All indications are ± B trigger error.*
b) Set A and B SLOPES to "+", FUNCTION to RATIO X MULT, and vary TIME BASE/MULTIPLIER position. The results should correspond to MULTIPLIER setting as follows:	
Settings	
10^8	Indication not applicable. Reads .0000000 ±.0000001 on optional 8-digit readout.
10^7	.0000000 ±.0000001. OS lamp illum.
10^6	1.000000 ±.000001
10^5	01.00000 ±.00001
10^4	001.0000 ±.0001
10^3	0001.000 ±.001
10^2	00001.00 ±.01
10	000001.0 ±0.1
1	0000001 ±1

3.11.2 OPERATING PROCEDURES

Figures 3-7 through 3-12 provide functional block diagrams and instructions for operating the instrument in the Time Interval (Figure 3-7), Count-Scaling (Figure 3-8), Rate (Figure 3-9), Period (Figure 3-10), Period Average (Figure 3-11), and Ratio (Figure 3-12) modes of operation.

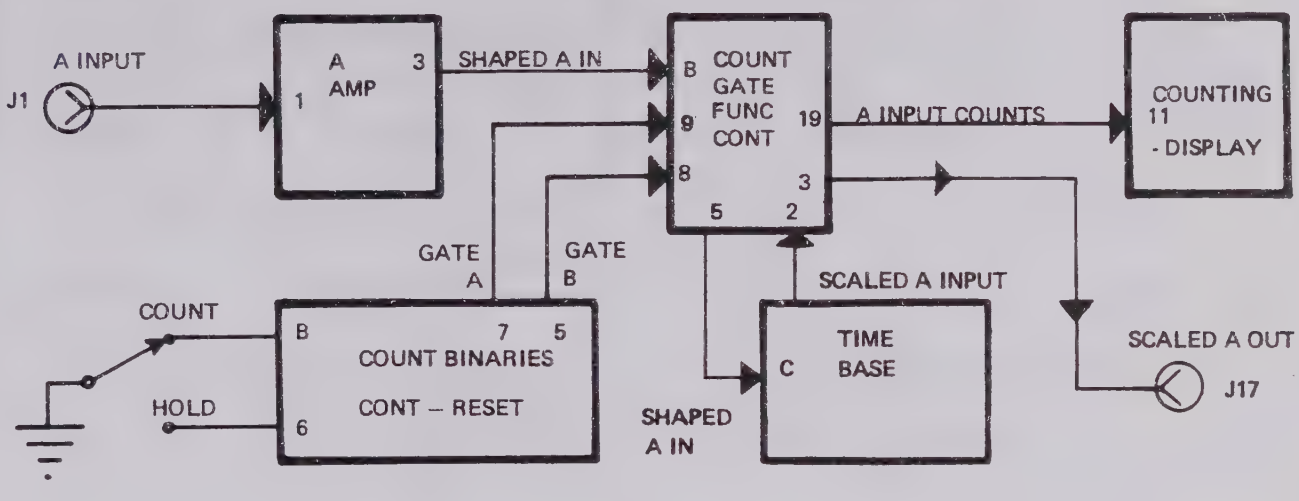
FIGURE 3-7 TIME INTERVAL MEASUREMENTS



Time Interval Measurements -- Typically, rise time, fall time, and pulse width measurements are accomplished as follows:

1. Set FUNCTION switch to TIME B-A and 1 MHz INT-EXT to INT.
2. Set A and B AC-DC switches as desired and A and B ATTEN switches as applicable.
3. Connect signal(s) to be measured to A INPUT (A and B INPUTS).
4. Set COM-SEP-TEST switch to:
   a. COM if start and stop signals are from same source.
   b. SEP if start and stop signals are from different sources.
5. Set TIME BASE/Multiplier switch to obtain measurement resolution required, or set 1 MHz INT-EXT switch to EXT if an external time unit is used.
6. Set A SLOPE switch to "+" if measurement is to start on positive slope. Set to "-" if measurement is to start on negative slope.
7. Adjust A TRIGGER LEVEL to set measurement start point at desired voltage level.
8. Set B SLOPE switch to "+" if measurement is to stop on positive slope. Set to "-" if measurement is to stop on negative slope.
9. Adjust B TRIGGER LEVEL to set measurement stop point at desired voltage level.
10. For precise measurements, trigger an oscilloscope with A or B MARKER (rear panel) connector signal to observe start (A MARKER) or stop (B MARKER) trigger setting.
11. Observe measurement results. Correct decimal point position and measurement unit information are displayed.

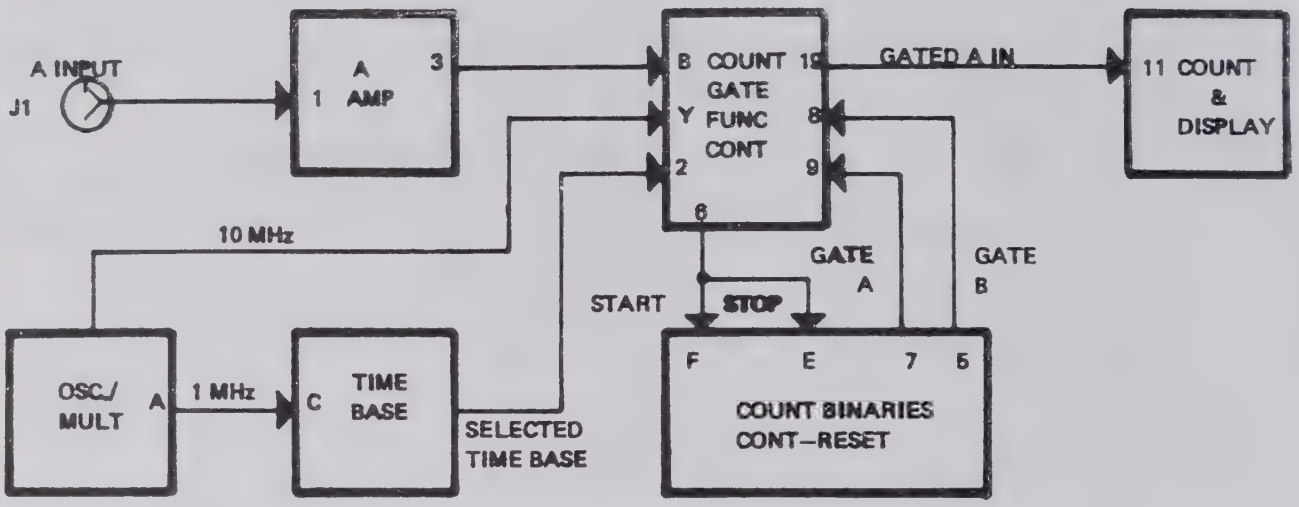
FIGURE 3-8 COUNT-SCALING MEASUREMENTS



Any signal from 0 to 10 MHz can be scaled by decade factors from 10 to 10^8. Proceed as with the COUNT mode, listed below. The scaled output (dependent upon TIME BASE/MULTIPLIER switch position) is available at rear panel mounted J17 -- OUT SCALE/T.B. OUT.

1. Set channel A ATTEN switch as applicable.
2. Apply signal to be totalized or scaled to A INPUT.
3. Place AC-DC (channel A) as desired andll MHz INT-EXT to INT.
4. Set FUNCTION switch to COUNT and COM/SEP/TEST to SEP.
5. Rotate channel A TRIGGER LEVEL until indicators begin to cycle (display storage is automatically defeated in COUNT).
6. If the count is to begin at particular point in time:
   a. Set FUNCTION switch to HOLD -- the counting stops.
   b. Depress RESET pushbutton -- count is returned to zero.
   c. Return FUNCTION switch to COUNT at desired "start" time.
7. The scaled output is available at J17 (each decade scale factor corresponds to a TIME BASE/MULTIPLIER switch multiplier position -- the 10 position equals a scale factor of 10, the 10^2 position equals a scale factor of 10^2, etc.).

FIGURE 3-9 RATE MEASUREMENTS

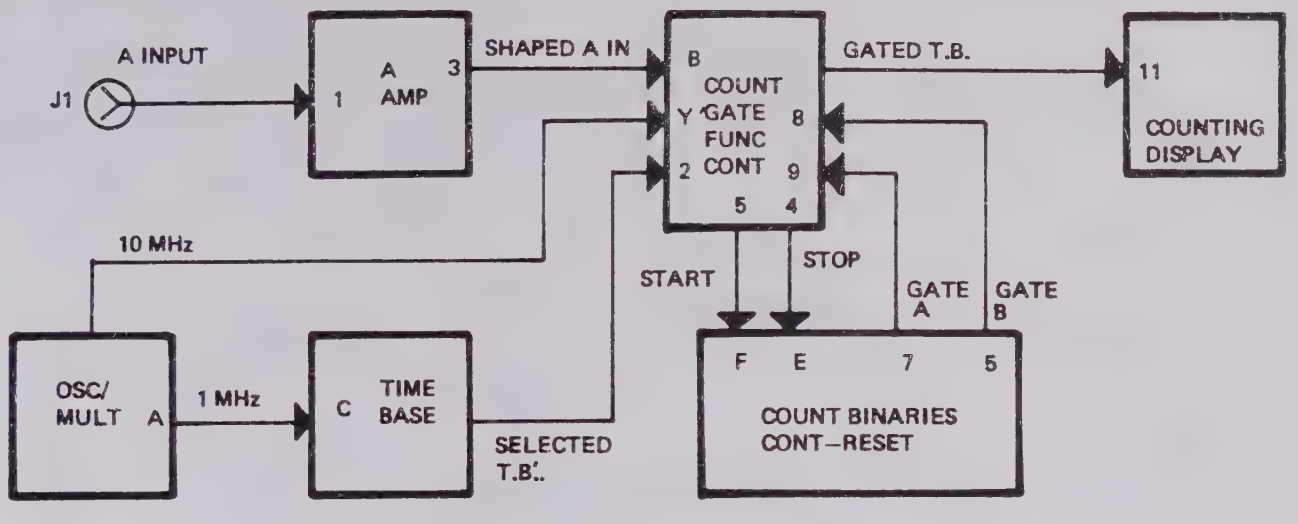


1. Place channel A SLOPE and AC-DC switches as desired.
2. Set channel A ATTEN switch as applicable and STORAGE to ON.
3. Rotate RECYCLE RATE to desired setting.
4. Set FUNCTION to RATE A and COM/SEP/TEST to SEP.
5. Set TIME BASE/MULTIPLIER for desired count (gate) time.
6. Set 1 MHz INT-EXT switch to INT.
7. Connect unknown signal to A INPUT connector.
8. Rotate channel A TRIGGER LEVEL until a stable count is observed on the indicators. If no count is observed, place channel A ATTEN switch to next lower range.

NOTE: The less significant indicator digits normally fluctuate due to input signal instability.

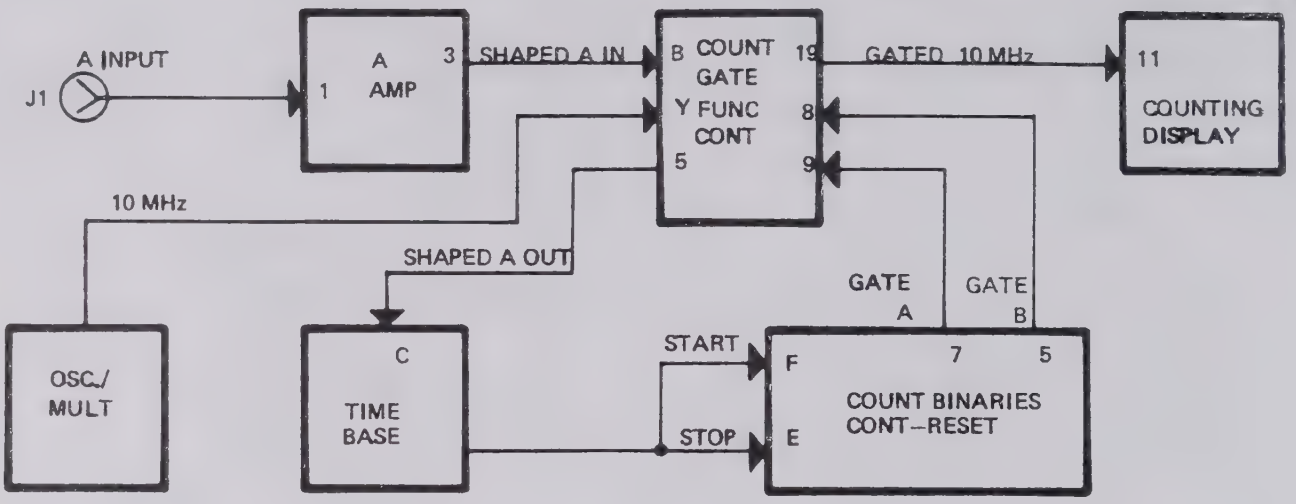
9. Read measurement result, including correct decimal point and measurement unit information, on display.

FIGURE 3-10 PERIOD MEASUREMENTS



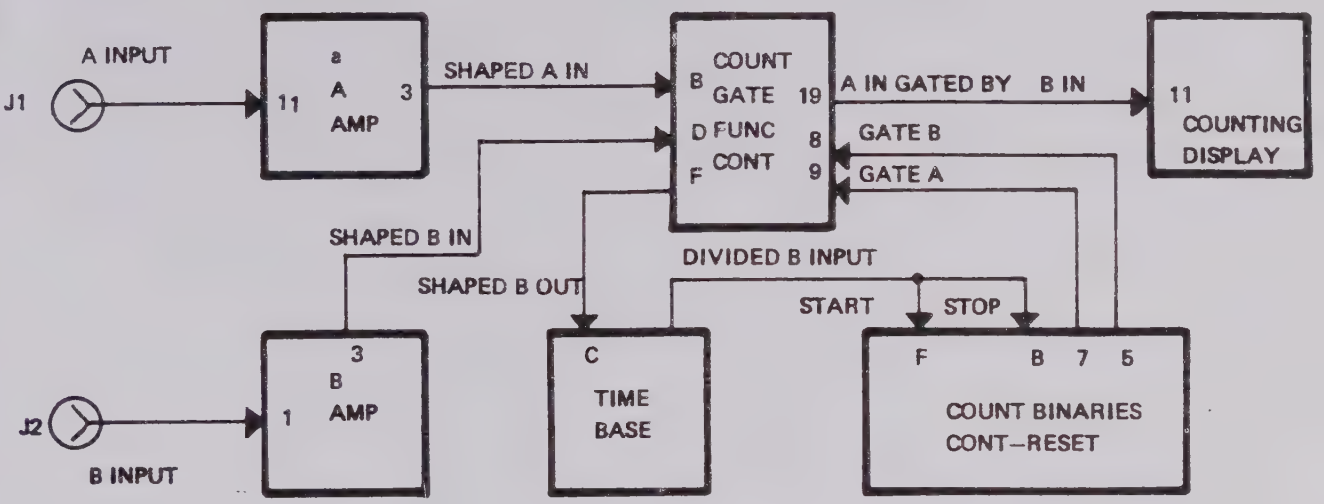
1. Set 1 MHz INTernal-EXTernal switch to INT and COM/SEP/TEST to SEP.
2. Set channel A SLOPE to "+" if measurement is to start on input signal's positive slope and to "-" if on negative slope. Set channel B SLOPE to "+" if measurement is to stop on input signal's positive slope and to "-" if on negative slope.
3. Set RECYCLE RATE as desired and STORAGE to ON.
4. Set channel A ATTENuation switch as applicable and channel A AC-DC as desired.
5. Set FUNCTION switch to PER A.
6. Set TIME BASE/MULTIPLIER to selected time base frequency (TIME BASE positions).
7. Connect unknown signal to A INPUT.
8. Rotate channel A TRIGGER LEVEL until a stable indication is displayed. If no indication is observed, place A ATTEN to next lower position.
9. Read period on display with correctly positioned decimal point and correct measurement unit information.

FIGURE 3-11 PERIOD AVERAGE MEASUREMENTS



1. Set 1 MHz INT-EXT to INT and COM/SEP/TEST to SEP.
2. Set channel A SLOPE and AC-DC switches as desired.
3. Set RECYCLE RATE as desired and STORAGE to ON.
4. Set channel A ATTEN switch as applicable.
5. Set FUNCTION switch to PER A X MULT.
6. Set TIME BASE/MULTIPLIER to selected number of periods to be averaged (MULTIPLIER positions).
7. Connect unknown signal to A INPUT.
8. Rotate channel A TRIGGER LEVEL until stable count is observed. If no indication is displayed set A ATTEN to next lower range.
9. Read period average, including correct decimal point position and measurement unit information, on display.

FIGURE 3-12 RATIO MEASUREMENTS



1. Set COM/SEP/TEST to SEP.
2. Set channel A SLOPE and AC-DC switches as desired.
3. Set channel B SLOPE and AC-DC switches as desired.
4. Set RECYCLE RATE as desired.
5. Set channel A and channel B ATTEN switches as applicable.
6. Set TIME BASE/MULTIPLIER to desired multiple.
7. Connect 0 to 20 MHz signal to A INPUT.
8. Connect 0 to 10 MHz signal to B INPUT.
9. Monitor GATE lamp; adjust channel B TRIGGER LEVEL for proper gate indication (GATE lamp illuminates when measurement gate -- IC9B, Function Control Board -- is open). See Step 12.
10. Place STORAGE switch to OFF and adjust channel A TRIGGER LEVEL until display indicators begin to cycle (as in COUNT operation). Set STORAGE switch to ON. See Step 12.
11. Read ratio A/B X MULTiplier on display with automatically positioned decimal point and no measurement unit -- ratio is dimensionless.
12. Alternate methods are to set both TRIGGER LEVELS to PRESET or observe trigger MARKER outputs.

4 THEORY OF OPERATION

Not Available

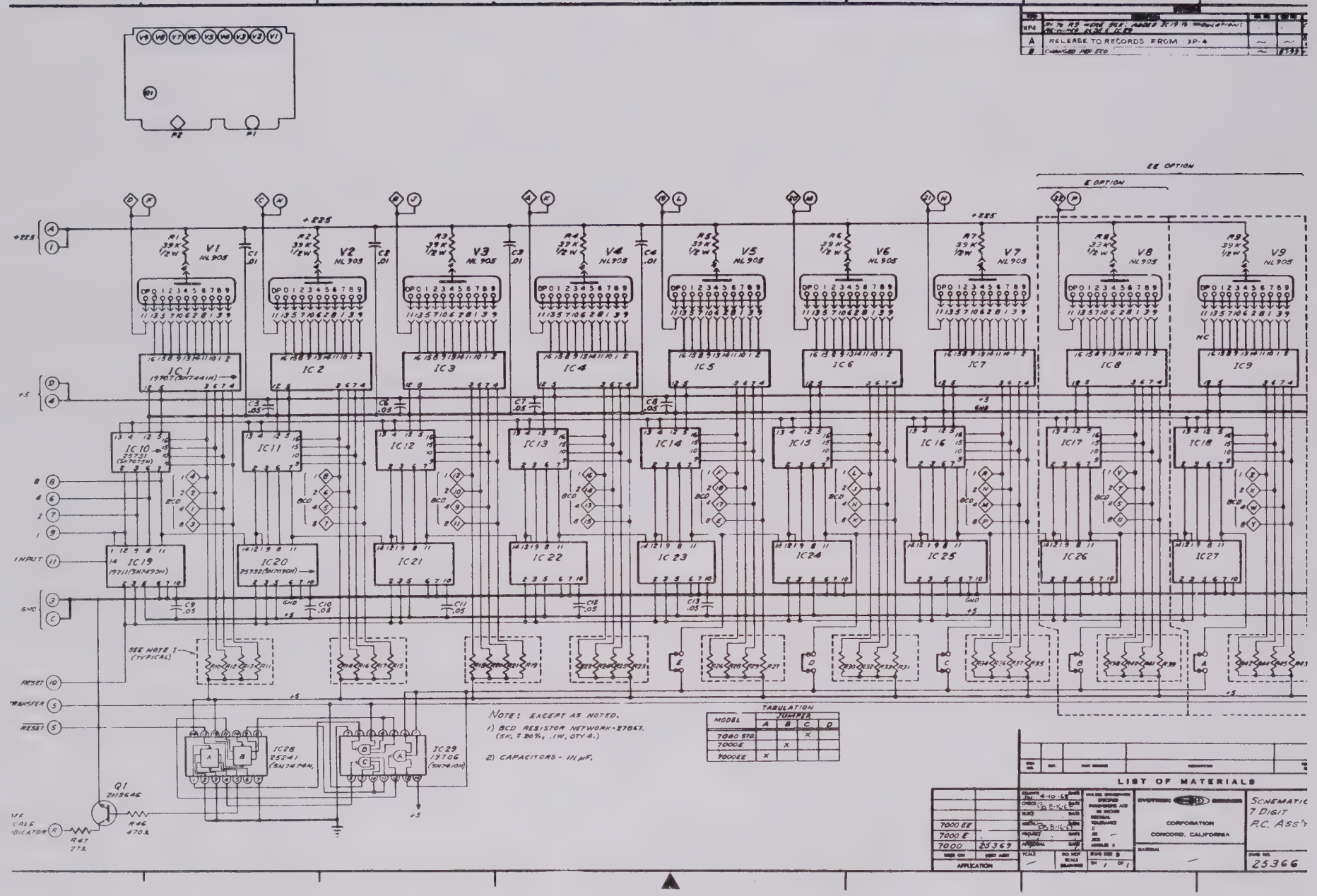
5 MAINTENANCE

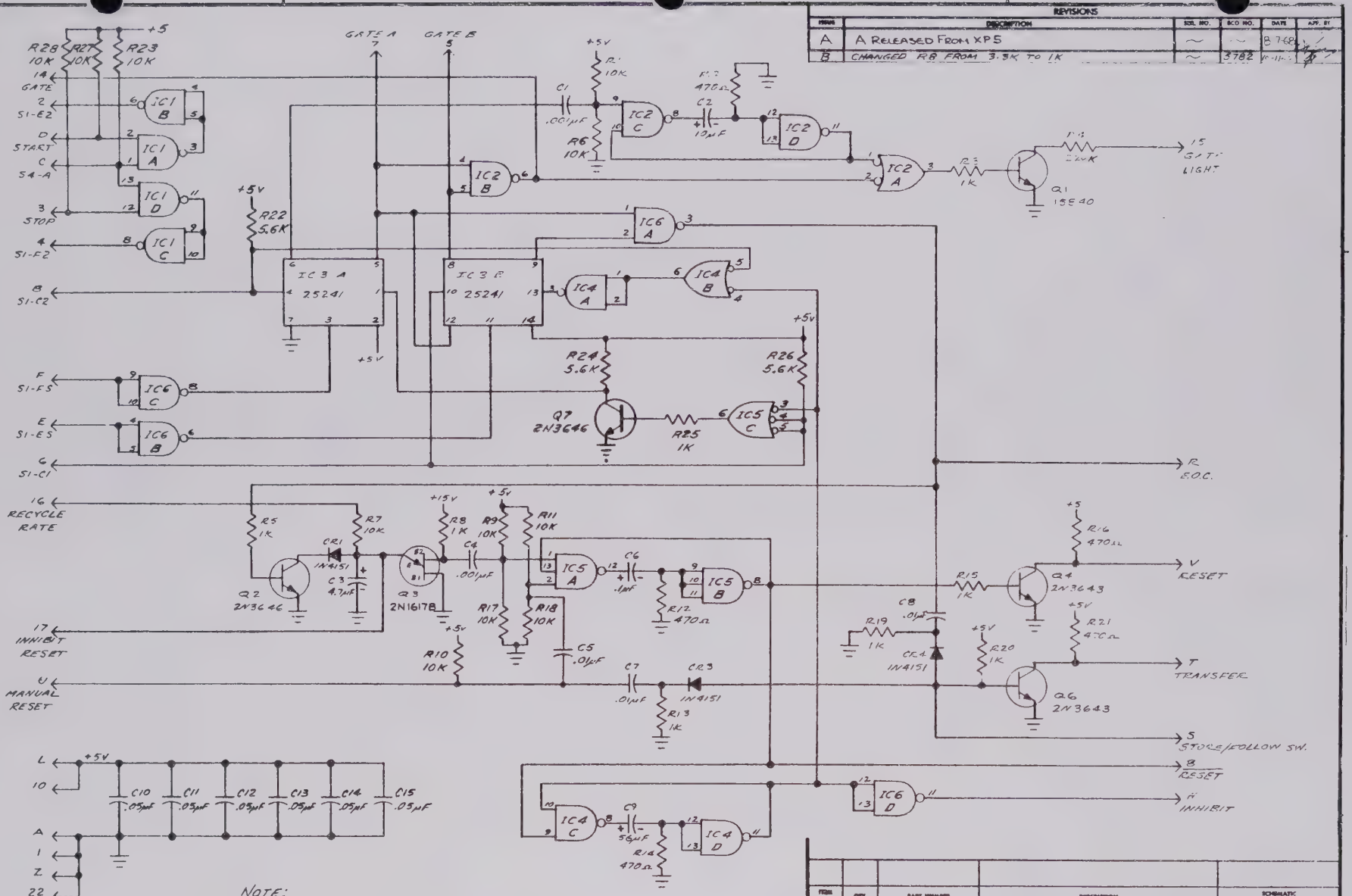
Not Available

6 PARTS LIST

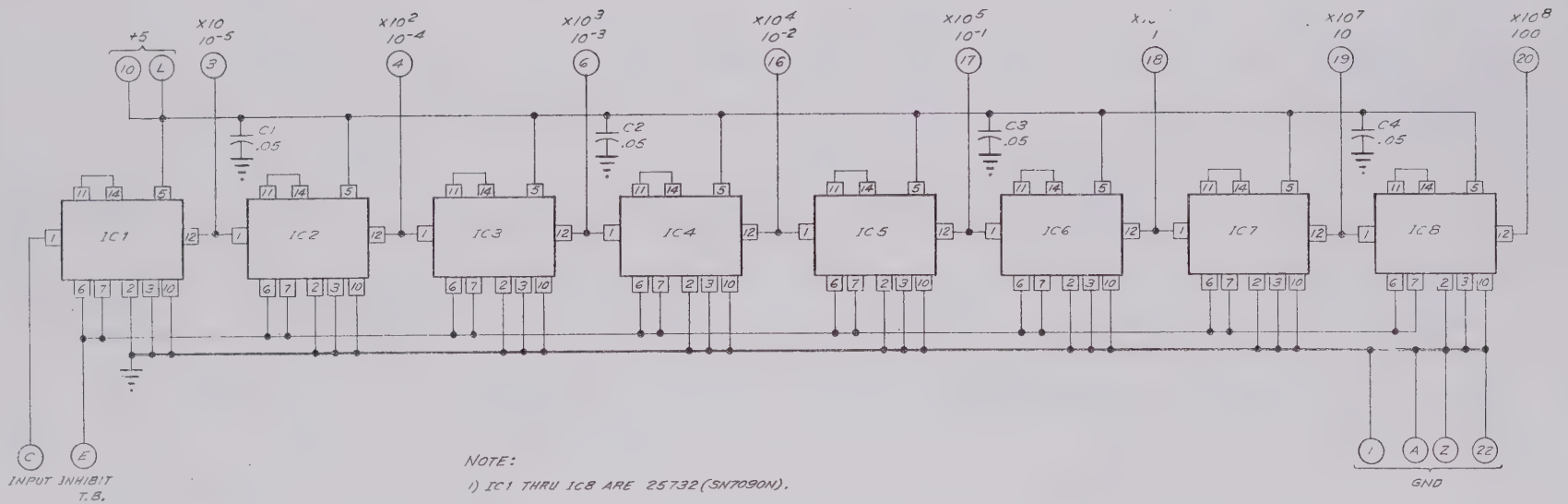
Not Available

7 DRAWINGS


REVISIONS
A RELEASE TO RECORDS FROM XP-4
EE OPTION
E OPTION
+5 VOLTS
GND
INPUT
RESET
TRANSFER
RESET
NOTE: EXCEPT AS NOTED.
1) BCD RESISTOR NETWORK-27867. (5K, ± 20%, .1W, QTY 4.)
2) CAPACITORS - .1 µF.
TABULATION
MODEL
JUMPER
A
B
C
D
7000 STD.
7000E
7000EE
LIST OF MATERIALS
SCHEMATIC 7 DIGIT P.C. ASS'Y
DRAWING NO. 25366
7000 EE
7000 E
7000 25369
APPLICATION


REVISIONS
A Released From XP5
B Changed R8 from 3.3K to 1K
R28 10K
R27 10K
R23 10K
GATE A
GATE B
+5
GATE
S1-E2
START
S4-A
STOP
S1-F2
S1-C2
S1-F5
S1-E5
S1-C1
RECYCLE RATE
INHIBIT RESET
MANUAL RESET
IC1 B
IC1 A
IC1 D
IC1 C
IC2 B
IC2 C
IC2 D
IC2 A
IC6 A
IC3 A 25241
IC3 B 25241
IC4 A
IC4 B
IC6 C
IC6 B
IC5 C
IC5 A
IC5 B
IC6 D
IC4 C
IC4 D
R1 10K
R2 470Ω
C1 .001μF
C2 10μF
R6 10K
R22 5.6K
R24 5.6K
R26 5.6K
R25 1K
Q7 2N3646
R5 1K
R7 10K
CR1 IN4151
C3 4.7μF
Q2 2N3646
Q3 2N1617B
R8 1K
R9 10K
R11 10K
C4 .001μF
C6 .1μF
R12 470Ω
R17 10K
R18 10K
C5 .01μF
R10 10K
C7 .01μF
CR3 IN4151
R13 1K
C9 56μF
R14 470Ω
R16 470Ω
R15 1K
Q4 2N3643
C8 .01μF
R19 1K
CR4 IN4151
R20 1K
R21 470Ω
Q6 2N3643
R E.O.C.
V RESET
T TRANSFER
S STORE/FOLLOW SW.
B RESET
H INHIBIT
C10 .05μF
C11 .05μF
C12 .05μF
C13 .05μF
C14 .05μF
C15 .05μF
L
10
A
1
Z
22
11
M
12
N
13
P
+15V
-15V
-5V
NOTE:
1) IC1 - 19705, GND-PIN 7, +5V-PIN 14.
IC2 -
IC4 -
IC5 - 19706
IC6 - 19705
2) RESISTORS - 1/4w, 5%.
LIST OF MATERIALS
ITEM NO. | QTY. | PART NUMBER | DESCRIPTION | SCHEMATIC REF. NO.
DRAWN JENNINGS 4-8-68
CHECK 4-23-68
ELECT. DATE
MECH 8-7-68
PROJECT DATE
MATERIAL DATE
SCALE
DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL TOLERANCE
X
.XX
.XXX
ANGLES ±
DWG SIZE C
SH / OF /
SYSTRON DONNER CORPORATION
CONCORD, CALIFORNIA
MATERIAL
7015 25401
7014 25401
USED ON | NEXT ASSY
APPLICATION
SCHEMATIC
CONTROL & RESET
PC ASSEMBLY
DWG NO. 25398
ISSUE B

REVISIONS				
ISSUE	DESCRIPTION	ECO NO	DATE	APP'D
A	A RELEASED FROM XPI			



NOTE:

1) IC1 THRU IC8 ARE 25732(SN7090N).

2) CAPS ARE IN μF.

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO

LIST OF MATERIALS

PROPRIETARY DATA

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USED ON	NEXT ASSY
7038	27885
7035	↓
7034	
APPLICATION	

DRAWN JN 12-28-68 DATE
CHECK EB 12-28-68 DATE
ELEC [illegible] 12-29-68 DATE
MECH EB 12-28-68 DATE
PROJECT [illegible] 12-29-68 DATE
APPROVAL [illegible] 12-31-68 DATE
SCALE — DO NOT SCALE DRAWING
DWG SIZE C SH 1 OF 1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL TOLERANCE
.X
.XX —
.XXX
ANGLES +

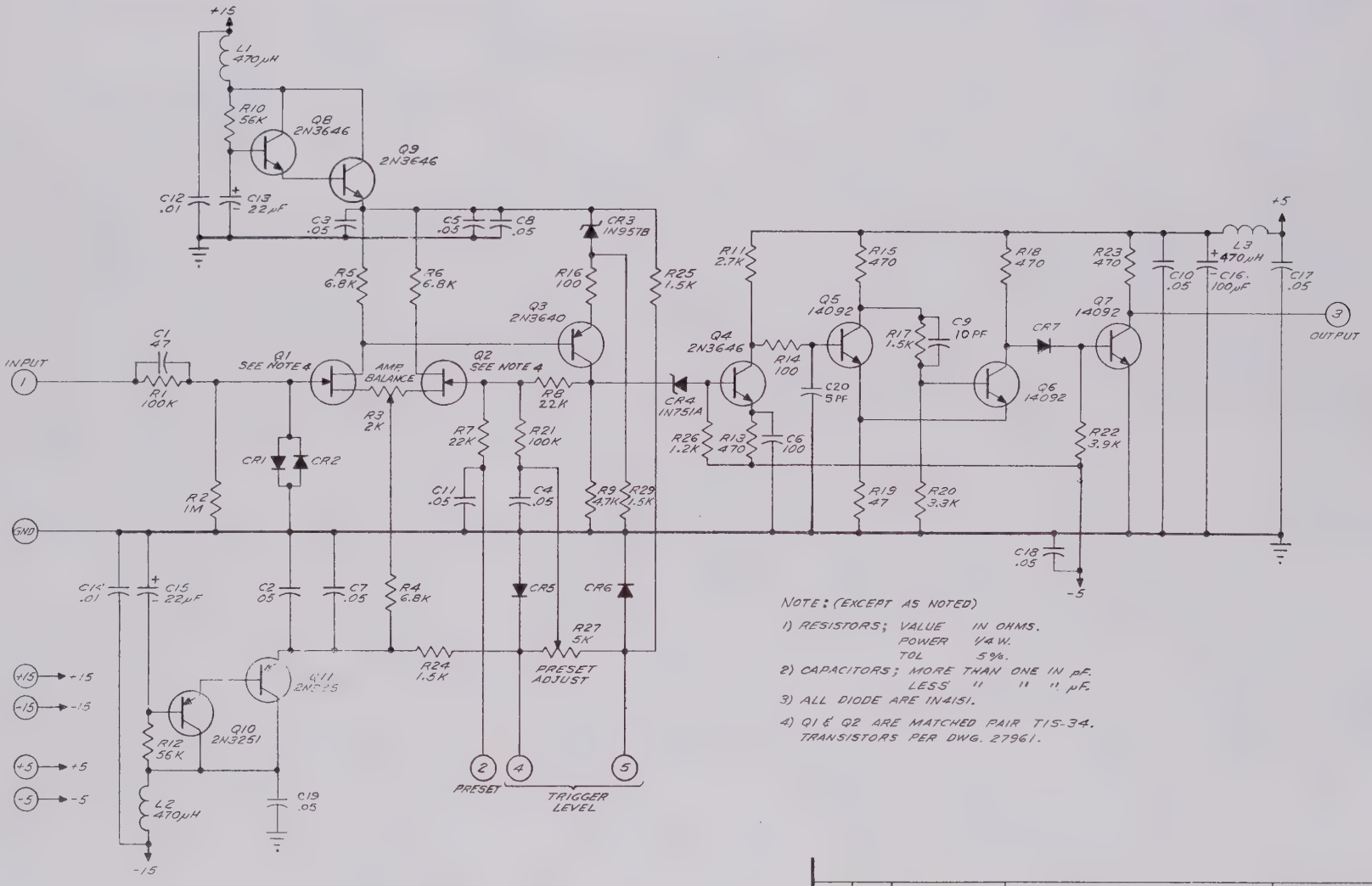
SYSTRON DONNER CORPORATION
CONCORD, CALIFORNIA

MATERIAL —

SCHEMATIC - TIME BASE DIVIDER PC ASSEMBLY

DWG NO 27886 ISSUE A

REVISIONS					
ISSUE	DESCRIPTION		ECO NO.	DATE	APP. BY
A	TO RECORDS FROM XP-1	—		2-3-69	
B	CHANGED PER ECO	~	5834	3/18/69	



NOTE: (EXCEPT AS NOTED)

1) RESISTORS; VALUE IN OHMS.
   POWER 1/4 W.
   TOL 5%.
2) CAPACITORS; MORE THAN ONE IN pF.
   LESS " " " μF.
3) ALL DIODE ARE IN4151.
4) Q1 & Q2 ARE MATCHED PAIR TIS-34.
   TRANSISTORS PER DWG. 27961.

ITEM NO.	QTY.	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO.

LIST OF MATERIALS

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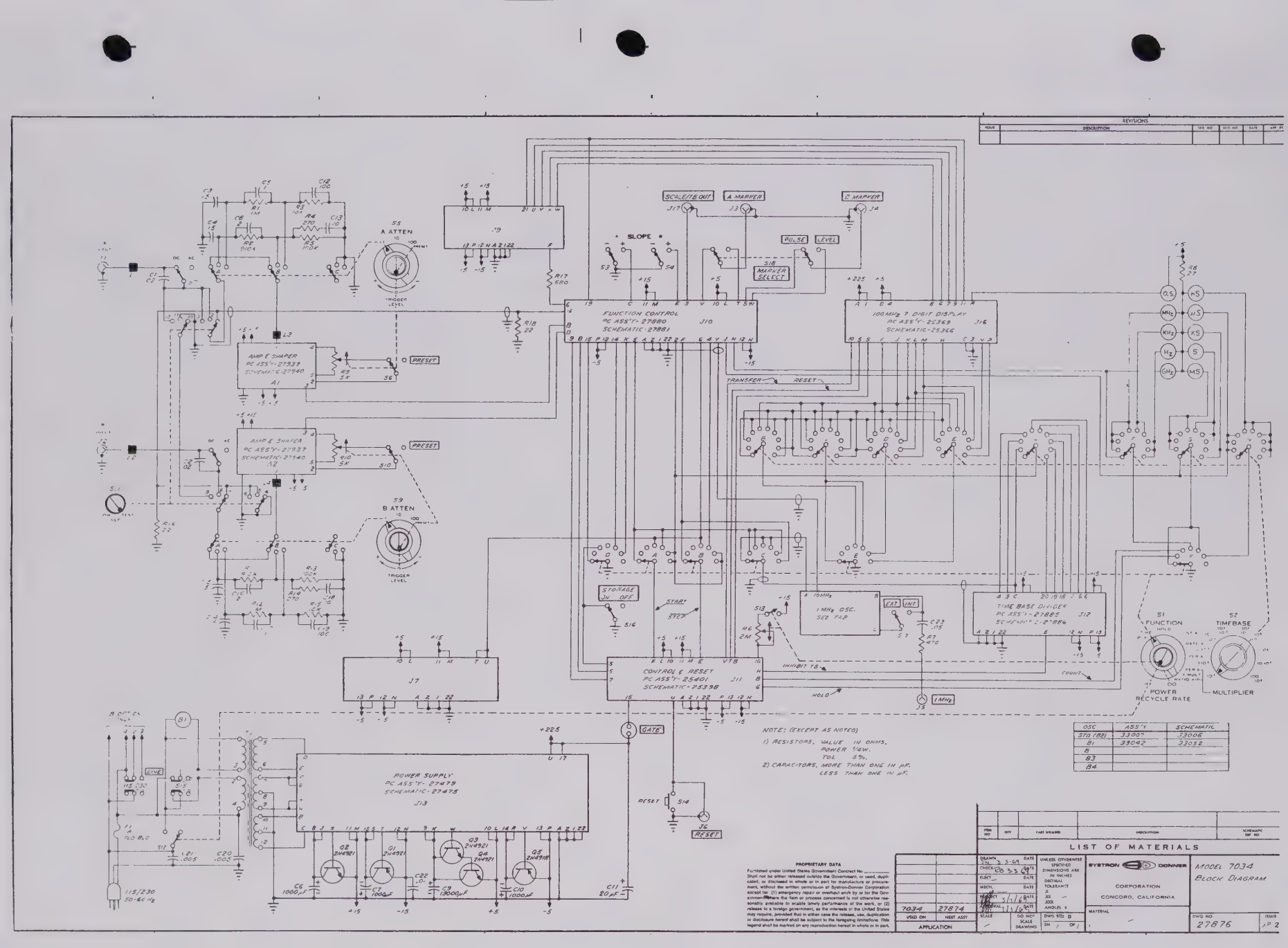
DRAWN ZN	2-3-69 DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE X .XX .XXX ANGLES ±	SYSTRON DONNER CORPORATION CONCORD, CALIFORNIA
CHECK	DATE		
ELECT.	DATE		
MECH.	DATE		
PROJ.	DATE		
APPR.	DATE		
7034	27937		
USED ON	NEXT ASSY	SCALE — DO NOT SCALE DRAWING	DWG SIZE C SH 1 OF 1
APPLICATION			

MATERIAL —

SCHEMATIC - AMP & SHAPER PC ASS'Y

DWG NO. 27940 ISSUE B


REVISIONS
ISSUE
DESCRIPTION
TPR NO
ECO NO
DATE
APP BY
A ATTEN
B ATTEN
TRIGGER LEVEL
SLOPE
SCALE/TB OUT
A MARKER
B MARKER
PULSE
LEVEL
SIB MARKER SELECT
FUNCTION CONTROL PC ASS'Y- 27880 SCHEMATIC-27881 J10
100 MHz 7 DIGIT DISPLAY PC ASS'Y- 25369 SCHEMATIC-25366 J16
AMP & SHAPER PC ASS'Y- 27937 SCHEMATIC-27940 A1
AMP & SHAPER PC ASS'Y- 27937 SCHEMATIC-27940 A2
PRESET
TRANSFER
RESET
STORAGE
START
STOP
1 MHz OSC. SEE TAB
EXT
INT
TIME BASE DIVIDER PC ASS'Y- 27885 SCHEMATIC- 27886 J12
CONTROL & RESET PC ASS'Y- 25401 SCHEMATIC- 25398 J11
INHIBIT TB
COUNT
HOLD
1 MHz
GATE
RESET
POWER SUPPLY PC ASS'Y- 27479 SCHEMATIC- 27475 J13
115/230 50-60 c/s
LINE
S1 FUNCTION
S2 TIMEBASE
POWER RECYCLE RATE
MULTIPLIER
OSC | ASS'Y | SCHEMATIC
STD (B2) | 33007 | 33006
B1 | 33042 | 33052
B
B3
B4
NOTE: (EXCEPT AS NOTED)
1) RESISTORS, VALUE IN OHMS, POWER 1/4W. TOL 5%.
2) CAPACITORS, MORE THAN ONE IN μF. LESS THAN ONE IN μF.
PROPRIETARY DATA
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ITEM NO
QTY
PART NUMBER
DESCRIPTION
SCHEMATIC REF NO
LIST OF MATERIALS
DRAWN
CHECK
ENGR
PROJECT
MECH
MATERIAL
APPROVAL
SCALE
DATE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE X .XX .XXX ANGLES ±
DWG SIZE D
SH 1 OF 1
DO NOT SCALE DRAWING
7034
27874
USED ON
NEXT ASSY
APPLICATION
SYSTRON DONNER CORPORATION CONCORD, CALIFORNIA
MODEL 7034 BLOCK DIAGRAM
DWG NO 27876
ISSUE P 2

REVISIONS					
ISSUE	DESCRIPTION	NO.	ECO NO.	DATE	APP BY
A	TO RECORDS FROM XP-1	—	—	1-9-69	

NOTE: (EXCEPT AS NOTED).
1) RESISTORS: VALUE — IN OHMS.
POWER - 1/4W.
TOL. — 5%.
2) CAPACITORS: MORE THAN ONE IN pF.
LESS " " " μF.
3) ALL DIODES IN4151.
4) ALL INTEGRATED CIRCUITS 19705 (SN7400N).
5) INTEGRATED CIRCUIT POWER CONNECTIONS:
GND — PIN 7.
+5 — PIN 14.

SELECTED T.B. (2)
T.B./SCALE OUTPUT (3)
A AMP (B)
+A SLOPE (C)
START (5)
B AMP (D)
+B SLOPE (E)
10 MHz (Y)
TEST 10 MHz (16)
SELECTED B STOP & MULTIPLE (F)
A GATE (9)
B GATE (8)
PULSE MARKER (U, T)
LEVEL MARKER (V, 18)
SELECT A-Ā STOP-PER (4)
PULSE MARKER (R, S)
LEVEL MARKE (W, X)
GATED COUNT (7034) (19)

IC1 IC2 IC3 IC4 IC5 IC6 IC7
R1 5.6K, R25 1K, C7 .05, R9 5.6K, R26 5.6K
R2 5.6K, R5 5.6K, R6 5.6K, C1 220, C2 .001, R3 5.6K, R4 470
R7 5.6K, R8 5.6K, P/O IC8
R10 5.6K, R13 5.6K, R15 5.6K, C3 220, C4 .001, R11 5.6K, R12 470
R14 5.6K, R16 5.6K, C8 .05, P/O IC8
R17 5.6K, C11 .05
R20 5.6K, C9 .05
R21 470, C5 220, P/O IC9 19706(SN7410N)
R23 6.8K, R24 220, C10 .05, C6 .05, Q1 2N3646, R22 470, R18 470, R19 100, C12 .001
P/O IC9 19706(SN7410N)
CR1 CR2 CR3 CR4 CR5 CR6

ITEM NO.	QTY.	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO.

LIST OF MATERIALS

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USED ON	NEXT ASSY
7038	27880
7035	
7034	
APPLICATION	

DRAWN JN 12-31-68 DATE
CHECK RB 1-9-69 DATE
ELECT 1-17-69 DATE
MECH. RB 1-9-69 DATE
PROJECT 1-17-69 DATE
APPROVAL 1-17-69 DATE
SCALE — DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL TOLERANCE
X
XX
XXX
ANGLES ±
DWG SIZE C
SH 1 OF 1

SYSTRON DONNER CORPORATION
CONCORD, CALIFORNIA
MATERIAL —

SCHEMATIC - FUNCTION CONTROL PC ASS'Y

DWG NO. 27881
ISSUE A

REVISIONS					
PREFIX	DESCRIPTION	ECO	ECO NO.	DATE	APP. BY
XP2	R119,120 WAS 560Ω; CR117,118 WAS IN752A	—	0879	9/24/68	
XP3	MOVED LEAD FROM JUMPER AT Q106 TO PIN ⑭ TO PINS IN ⑨ & ⑬	—	XCO 0892	10-6-68	
A	RELEASED TO RECORDS FROM XP-3		—	11-7-68	

NOTE: (EXCEPT AS NOTED).

1) 1 AMP SB 115v.
.5 AMP SB 230v.

2) RESISTORS:
VALUE--- IN OHMS.
POWER--1/4 W.
TOL----5%.

3) CAPACITORS:
CAPACITY--IN μF.

4) ⏚ CHASSIS GROUND.

5) ALL DIODES IN4005.

B1 FAN

B OPTION ONLY

T1

115 230

S5

OFF

POWER

P1

115/230
50-60Hz

C16 .005μF

C17 .005μF

F1 (SEE NOTE 1)

CR122 IN4719

CR123 IN4719

CR101 CR102 CR103 CR104 CR105 CR106 CR107 CR108 CR109 CR110

+9 UNREG

-9 UNREG

+225 (30MA)

R101 180K 1/2W

+20 UNREG

C9 13,000

C10 1,000

C11 1,000

C6 1,000

C7 1,000

Q3 2N4921

Q4 2N4921

Q2 2N4921

Q1 2N4918

Q5 2N4918

POWER SUPPLY P.C. ASSEMBLY 27479

CR114 IN752-A

R111 390

R112 1K

R113 15

R117 47

R118 47Ω TM1/4

R116 100

+5 ADJ

R114 100

Q104 2N3638

Q105 2N3568

R110 1.2K

C102 1

CR115 IN4370

R115 150

+15 (200MA)

+5 (1 AMP)

-20 (UNREG)

GRN +5

RED +15

ORN -5

R119 470

R120 470

CR117 IN966B

CR118 IN966B

-5

-15

R125 1K

R126 47

R129 47Ω TM1/4

R127 100

R130 100

-5V ADJ

Q107 2N3638

Q108 2N3638

R124 15

R128 1K

CR119 IN752A

R121 390

Q106 2N3568

R122 1.2K

C103 .1

R123 4.7K

CR120 IN4370

LIST OF MATERIALS

ITEM NO.	QTY.	PART NUMBER	DESCRIPTION	REFERENCE DES. NOS.

PROPRIETARY DATA

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		DRAWN	9-19-67	DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X ±.1 .XX ±.03 ANGLES ±
		CHECK		DATE	
		ENGR.		DATE	
		MFGR.		DATE	
		PROJ.		DATE	
		APPD.		DATE	
7000	27479	SCALE		DO NOT SCALE DRAWING	SYSTEM DES. E
USED ON	NEXT ASSY				
APPLICATION					

SYSTRON DONNER CORPORATION
CONCORD, CALIFORNIA

MATERIAL

SCHEMATIC - POWER SUPPLY P.C. ASSY

DWG NO. 27475

REV A

MP MASTER
MA24024

DUDLEY
SERIALS
MONTEREY

DUPLICATE
53540